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(54) PRODUCTION OF POROUS BODY AND PRODUCTION OF SENSOR

(57)Abstract:
PURPOSE: To obtain a porous body for sensor, etc., in good productivity by keeping a solution containing a monomer, etc., polymerizable by irradiation of energy beam and an inactive phase-separating agent compatible with the monomer and incompatible with its polymer in desired shape and irradiating the solution with energy beam.
CONSTITUTION: A uniform polymerizable solution obtained by mixing (A) an acrylic acid-based or acrylic acid ester-based monomer/or oligomer polymerizable by irradiation of energy beam and/or oligomer with (B) a phase separating agent compatible with monomer of the component A and incompatible with a polymer obtained by irradiating the monomer and/or oligomer with energy beam and inactive to energy beam, e.g. polyethylene glycol or polyvinylpyrrolidone is kept in a desired shape on a support and then irradiated with energy beam or the solution is cast on the support and then masked into a desired shape and irradiated with energy beam to provide the objective porous body useful as a sensor, etc., in good productivity.

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JAPANESE [JP,06-100725,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS EXAMPLE

[Translation done.]

* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] By irradiation of an energy line, the monomer and/or oligomer (A) in which a polymerization is possible, It does not dissolve with the polymer generated by dissolving with this monomer and/or oligomer (A), and irradiating an energy line at these monomers and/or oligomer (A). And the uniform polymerization nature solution which mixed the inactive phase separation agent (B) to the energy line The manufacture method of the porosity object characterized by masking a desired configuration and irradiating an energy line after irradiating an energy line after allotting the configuration of a request on a base material, or carrying out the cast on a base material.
[Claim 2] a polymer solution -- the above-mentioned monomer and/or oligomer (A), and a phase separation agent (B) -- a sensor function -- having – and the porosity after irradiation of an energy line -- the manufacture method according to claim 1 which is a thing containing the component (C) fixed or supported by the inside of the body
[Claim 3] The manufacture method according to claim 2 that a component (C) is an antigen, an antibody, an enzyme, or a catalyst.
[Claim 4] The manufacture method according to claim 2 that a component (C) is what has a sensor function to the component contained into blood.
[Claim 5] The manufacture method of any one publication of the claim 1-4 which uses ultraviolet rays or an electron ray for an energy line.
[Claim 6] The manufacture method of any one publication of the claim 1-5 which performs irradiation of the energy line to a polymerization nature solution in the state which embedded the electrode in the polymerization nature solution, or the state where it was made to contact.
[Claim 7] The manufacture method of any one publication of the claim 1-5 that a monomer and/or oligomer (A) are what makes a principal component the monomer and/or oligomer of an acrylic-acid system or an acrylic-ester system.
[Claim 8] The manufacture method of the sensor characterized by making it fix or support after infiltrating what has a sensor function on the porosity object acquired by the claim 1.
[Claim 9] The manufacture method according to claim 8 that it is an antigen, an antibody, an enzyme, or the catalyst that has a sensor function.
[Claim 10] The manufacture method according to claim 8 which is that in which what has a sensor function has a sensor function to the component contained into blood.
[Claim 11] The manufacture method of any one publication of the claim 8-10 that the thickness of a porosity object is 0.005-5mm.
[Claim 12] The manufacture method according to claim 11 that a porosity object is what has the pore of 0.01-5 micrometers of apertures.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] this invention relates to the manufacture method of the porosity object which makes a porous membrane the representation, the method of manufacturing the porosity object of a desired size and configuration, and the manufacture method of the sensor which makes a component the porosity object manufactured by this method, without starting in more detail using energy-line hardening resin.
[0002]
[Description of the Prior Art] When filtering with the porosity object of a minute configuration, generally the porosity object is used in the configuration united with the frame or the container. Moreover, the so-called multiscreen plate with which much porosity objects were formed in one underframe for the purpose of the improvement in efficiency of filtration and analysis is used.
[0003] In sensors, such as a chemical sensor and a biosensor A porosity object is incorporated [**** /, for the purpose of transportation (expansion) of the sample liquid object by capillarity, or] by filtration for the purpose of absorption of an excessive sample liquid object for the purpose of making a color reagent, an enzyme, an antibody, ****, a catalyst, an organelle, a microorganism, etc. hold, and giving itself a sensor function for the purpose of removing or intercepting the obstruction of analysis in an analyte.
[0004] In manufacturing the filter and sensor which make such a porosity object a part [the component], it was a usual state to create the porosity object of a large area beforehand until now, to start it in required size and configuration by methods, such as punching, and to fix to the appropriate part of a filter or a sensor by methods, such as adhesion.
[0005]
[Problem(s) to be Solved by the Invention] However, in order to miniaturize a filter and a sensor or to make detection possible with a little sample, it is necessary to make the size of a porosity object small. However, when it was going to make the size of a porosity object small even for especially millimeter order, various problems had arisen. For example, when the porosity object of a request configuration was pierced from the porosity object of a large area, the defect of the letter of a crack tended to occur around near the cutting section (i.e., a porosity object), and it had become a problem, so that the size of a porosity object was made small. Moreover, very precise work was needed for handling and adhesion of a porosity object of a minute configuration, and not only the fall of productivity but the fall of a rose and the yield of a performance was caused.
[0006]
[Means for Solving the Problem] Also in the case of a minute configuration, the yield of this invention person etc. is good with high degree of accuracy in the porosity object which constitutes a filter and a sensor. And as a result of examining how to have and manufacture for high productivity wholeheartedly, the energy-line hardening resin of the specific composition for porosity object manufacture is used. If it

masks and an energy line is irradiated after irradiating an energy line after allotting the configuration of a request on a base material, or carrying out the cast on a base material The porosity object which could manufacture the porosity object of a desired size and configuration, without starting, and was manufactured remains as it is. Or it finds out that various kinds of sensors by making this fix or support the component which has sensor functions, such as an antigen, an antibody, an enzyme, a catalyst, and a microorganism, can be manufactured, and came to complete this invention.

[0007] That is, this invention offers the manufacture method of the sensor characterized by making it fix or support, after infiltrating the component (C) characterized by providing the following. They are the monomer in which a polymerization is possible, and/or oligomer (A) by irradiation of an energy line. It does not dissolve with the polymer generated by dissolving with this monomer and/or oligomer (A), and irradiating an energy line at these monomers and/or oligomer (A). And the uniform polymerization nature solution which mixed the inactive phase separation agent (B) to the energy line It is a sensor function to the manufacture method of the porosity object characterized by irradiating an energy line where a desired configuration is masked after irradiating an energy line after allotting the configuration of a request on a base material, or carrying out the cast on a base material, and the porosity object acquired by this manufacture method.

[0008] In addition, the sensor obtained by the manufacture method of this invention may be a sensor of arbitrary methods, such as what is detected by what is depended on what is depended on electrochemical detection, for example, a POTENSHOMETORI-method, and an amperometry method and the thing to depend on a colorimetry method, for example, coloring, fading, and hue change, a thing to depend on fluorescence luminescence or a fluorescence quenching method, and a thing to depend on a chemiluminescence.

[0009] Hereafter, this invention is further explained to a detail. As the monomer and/or oligomer (A) which are used for this invention That what is necessary is just the object which does not ask organic and inorganic, but carries out a polymerization by irradiation of an energy line, and serves as polymer Although radical polymerization nature, anionic polymerization nature, cationic polymerization nature, etc. may be arbitrary things, what has 1-6 vinyl groups, an acrylic machine, meta-acrylic machines, and those mixture in 1 molecule is desirable, and what has a rate of polymerization quick especially by irradiation of an energy line is desirable.

[0010] As a monomer used for the above-mentioned this invention, for example Ethyl (meta) acrylate, Hydroxyethyl (meta) acrylate, hydroxypropyl (meta) acrylate, n-butyl (meta) acrylate, hexyl (meta) acrylate, 2-ethylhexyl (meta) acrylate, phenyl (meta) acrylate, Phenyl cellosolve (meta) acrylate, n-vinyl pyrrolidone, Isobornyl (meta) acrylate, JISHIKURO pentenyl (meta) acrylate, Dicyclopentenyloxy ether (meta) acrylate, an acrylamide, Single organic-functions monomers, such as N-alkyl acrylamide, diethylene GURIKORUJI (meta) acrylate, Neopentyl GURIKORUJI (meta) acrylate, 1, 6-hexane JIORUJI (meta) acrylate, A polyethylene GURIKORUJI (meta) acrylate, 2, and 2'-screw (4-(meth)acryloyloxy polyethyleneoxy phenyl) propane, 2 organic-functions monomers, such as a 2 and 2'-screw (4-(meth)acryloyloxy polypropyleneoxy phenyl) propane, 3 organic-functions monomers, such as TORIMECHI roll pro pantry (meta) acrylate and trimethylolethane tri(metha)acrylate, 6 organic-functions monomers, such as 4 organic-functions monomers, such as pentaerythritol tetrapod (meta) acrylate, and dipentaerythritol hexaacrylate, etc. are mentioned. Of course, it is also possible to mix and use these monomers.

[0011] As oligomer used for this invention, a polymerization is possible at energy-line irradiation, the thing of 500-50000 is mentioned and weight average molecular weight can mention the polyurethane resin which specifically has an acrylic machine or an methacrylic machine at the acrylic ester of an epoxy resin or a methacrylic ester, the acrylic ester of a polyether resin or a methacrylic ester, the acrylic ester of a polybutadiene resin or a methacrylic ester, and the molecule end, for example. Of course, it can also mix and use, and it can mix with a monomer and these oligomer can also be used.

[0012] It is desirable that it is that to which the monomer and/or oligomer (A) in which a polymerization is possible make a principal component the monomer and/or oligomer of an acrylic-acid system with a

quick rate of polymerization or an acrylic-ester system in these by irradiation of an energy line, for example, it is desirable that it is what is contained 50% of the weight or more in a monomer and/or oligomer (A). Moreover, since improvement in intensity, the improvement in a dimensional accuracy, and suppression of a dimensional change with time can be measured by introduction of the structure of cross linkage, it is desirable that it is what contains the thing more than a kind chosen from the group which the monomer and/or oligomer of an acrylic-acid system or an acrylic-ester system become from 2, 3, 4, 5, or 6 organic functions 50% of the weight or more. Furthermore, since a hydrophilic property or a water-repellent porosity object is acquired according to the use purpose, the raw material containing hydrophobic radicals containing hydrophilic groups and hydrophilic parts, such as a hydroxyl group, a carboxyl group, an amino group, an ammonium salt, amide combination, and ether linkage, such as a raw material, a fluorine, and a silyl machine, etc. can be chosen suitably, and it can also add.

[0013] It may not dissolve with the polymer generated when it dissolves as a phase separation agent (B) used for this invention with the monomer and/or oligomer (A) which are used for this invention and these monomers and/or oligomer (A) receive irradiation of an energy line, but what thing may be used as long as it is moreover inactive to an energy line.

[0014] It is necessary to dissolve substantially a phase separation agent (B), a monomer, and/or oligomer (A) uniformly at the time of energy-line irradiation, and in this invention, if an energy line is irradiated in the state where phase separation has arisen, the big closed cell of 10 micrometers or more of apertures will not occur, or a porosity object will not be formed.

[0015] Although the compatibility with a phase separation agent (B), a monomer, and/or oligomer (A) changes at various conditions and the temperature of the polymerization nature solution which contains these especially, it may change also according to the kind of a monomer and/or oligomer (A).

[0016] for example, in using for a molecule end the polyurethane resin which has an acrylic machine as polymerization nature oligomer As a phase separation agent (B), a methyl caprate, an ethyl caprate, a methyl laurate, Alkyl ester, such as a caprylic-acid methyl, an ethyl caprylate, and a diisobutyl adipate Dialkyl ketones, such as a diisobutyl ketone, alcohols, a liquefied polyethylene glycol, The monoester of a polyethylene glycol, and polyethylene-glycol sorbitan ester The poly ethylene glycol monoether, the monochrome of a glycerol, JI, and triester, The alkyl ester which has a hydroxyl group, alkylamines, and a polyethylene-glycol amine, Other surfactants etc. can use suitably mixture with more than these kinds and water further. Especially The monoester of a liquefied polyethylene glycol and a polyethylene glycol, Polyethylene-glycol sorbitan ester, the poly ethylene glycol monoether, The monochrome, JI, and TORI of a glycerol Alkyl esthetic which has ester and a hydroxyl group If RU, alkylamines, or a polyethylene-glycol amine is used Since viscosity of a polymerization nature solution can be made high, without reducing the solubility of a monomer and/or oligomer (A), Especially since the polymer which deposited by irradiation of an energy line tends to become mesh-like and the intensity of a porosity object becomes high while the condition range which can manufacture a porosity object becomes large, it is desirable.

[0017] It may dissolve in a liquefied monomer and/or liquefied oligomer (A), and as long as the phase separation agent (B) which can be used for this invention is inactive to energy-line irradiation, it may be a solid-state, for example, polymer. For example, cellulose acetate, an ethyl cellulose, a nitrocellulose, chitosan, polystyrene, a polyvinyl chloride, a polycarbonate, a polysulfone, polyether sulphone, polyurethane, a polyacrylonitrile, polyacrylic ester, a polyacrylic acid, a polymethylmethacrylate, a polyacrylamide, a polyethylene glycol, a polyvinyl pyrrolidone, polyvinyl alcohol, etc. these derivatives, and a copolymer can be illustrated, and a polyethylene glycol and a polyvinyl pyrrolidone are desirable especially. Of course, polymer may be two or more polymer. A phase separation agent (B) may be a polymer solution again.

[0018] A phase separation agent (B) may be single composition, and may be mixture. In the case of mixture, it does not dissolve with the polymer generated when it dissolves with the monomer and/or oligomer (A) which the mixture itself uses for this invention and these monomers and/or oligomer (A) receive irradiation of an energy line, and moreover, to an energy line, if inactive, what thing may be used

and especially a character component independent [the] will not be limited. For example, each component may be an object in which it does not dissolve with a monomer and/or oligomer, and it is not dissolved [also swell the polymer or], and may be dissolved with the polymer conversely generated from a monomer and/or oligomer (A).

[0019] A phase separation agent (B) can be suitably chosen with the solubility of the difference in the manufacture method of a porosity object, a monomer and/or the kind of oligomer (A), the viscosity of the polymerization nature solution needed, and the additive of polymer and others, an aperture, a configuration of pore needed for a porosity object, etc.

[0020] However, as for a phase separation agent (B), it is desirable in these that it is a nonvolatile liquid. When a phase separation agent (B) is an volatile liquid, the stratum compactum with a detailed aperture tends to be formed in the front face of a porosity object, and removal tends to become inefficient when a phase separation agent (B) is a solid-state. Moreover, when using ultraviolet rays as an energy line, as for a phase separation agent (B), what has a few ultraviolet absorption is desirable.

[0021] About the ratio to the monomer and/or oligomer (A) of a phase separation agent (B), since the range of the 0.1 - 4.0 weight section becomes [the voidage of a porosity object] low too much and is suitable, voidage moreover becomes high too much to a monomer and/or the (Oligomer A) 1 weight section and there is no bird clapper that intensity is inadequate, it is desirable.

[0022] The aperture of the pore of a porosity object is dependent on division doubling of others, a monomer and/or oligomer (A), and a phase separation agent (B). [mixing ratio / of a monomer and/or oligomer (A), and a phase separation agent (B)] Generally as for the relation, an aperture becomes [the case where the mixing ratio of a phase separation agent (B) is high, the case where the compatibility of a monomer and/or oligomer (A), and a phase separation agent (B) is bad, and the viscosity of a polymerization nature solution] large at a low case. The quality of the compatibility of a monomer and/or oligomer (A), and a phase separation agent (B) reduces the temperature of mixed liquor gradually, goes, and can be judged at the temperature which phase separation produces. Phase separation temperature has compatibility as good as a low. In this invention, it is desirable by selecting suitable conditions to form the pore of 0.01-5 micrometers of apertures. Although it is possible to also form the aperture below this range or beyond this range, the fall of the osmosis speed of a sample arises or it is easy to produce the fall of dimensional stability etc.

[0023] In the polymerization nature solution used for this invention, it is also possible to contain other components besides a monomer and/or oligomer (A), and a phase separation agent (B). for example, a sensor function -- having -- and the porosity after irradiation of an energy line -- the component (C) fixed or supported, an ultraviolet-rays polymerization initiator, etc. are mentioned to the inside of the body When using ultraviolet rays as an energy line, it is desirable to make a polymerization nature solution contain an ultraviolet-rays polymerization initiator in order to speed up a rate of polymerization.

[0024] As an ultraviolet-rays polymerization initiator used here Although there is no need of preparing especially restrictions, it is necessary to choose the object which can dissolve in a polymerization nature solution. For example, a p-tert-BUCHIRUTORI chloroacetophenone, 2, and 2'-diethoxy acetophenone, 2-hydroxy-2-methyl-1-phenyl propane -1-ON, The acetophenones of **; A benzophenone, 4, and 4'-bisdimethyl amino benzophenone, 2-chloro thioxan ton, 2-methylthio xanthone, 2-ethyl thioxan ton, Ketones, such as 2-isopropyl thioxan ton; A benzoin, a benzoin methyl ether, Benzoin ether, such as benzoin iso-propyl ether and benzoin isobutyl ether; benzyl ketals, such as a benzyl dimethyl ketal and a hydroxy cyclohexyl phenyl ketone, can be mentioned.

[0025] The base material used for this invention may be held in the fixed configuration between energy-line irradiation in a polymerization nature solution, and may unite with the case where it is used for the use purpose of a porosity object, exfoliating finally, and a porosity object.

[0026] Base materials may be the case where it is the nonvesicular matter, and the porosity matter again. As nonvesicular matter, there are semiconductor products, such as a polymer film, polymer mold goods, a metal plate, a glass plate, a semiconductor and also a transistor, and diode, etc., for example. The polymer moldings which has the crest which classifies two or more porosity objects formed of

energy-line irradiation as an example of the nonvesicular base material united with the porosity object fabricated by energy-line irradiation, a porosity object, the polymer film of a material to paste up, etc. are mentioned. Moreover, as an example of the base material of the porosity matter, a nonwoven fabric, filter paper, cloth, a network, etc. are mentioned. In the case of these porosity base materials, it usually unites with the porosity object manufactured.

[0027] A base material may be the independent film-like object and the independent tabular object, and may be a continuum. When a base material is a porosity object and really fabricated, a base material can also be cut after porosity object fabrication.

[0028] After carrying out the cast of the method of irradiating an energy line and stiffening a polymerization nature solution, after arranging ** polymerization nature solution on the configuration of a request on a base material as the manufacture method of this invention, or the ** polymerization nature solution on a base material, a desired configuration is masked (it contains, when irradiating a masking pattern through a lens system), an energy line is irradiated, and the method of stiffening a polymerization nature solution is mentioned.

[0029] That is, the configuration of the porosity object fabricated by the method of ** by energy-line irradiation can form a polymerization nature solution in a configuration [having allotted the desired configuration by methods, such as printing, dropping, and pouring,] on a base material. Moreover, it is also possible to arrange a mold and a frame on a base material, and to drop or pour in a polymerization nature solution within the mold and limit.

[0030] Moreover, the configuration of the porosity object fabricated by the method of ** by energy-line irradiation can be formed in the energy-line irradiation configuration of a polymerization nature solution. In this case, the configuration of a porosity object is able for the cast to the base material top of a polymerization nature solution to go to the whole base material top surface, and to be a larger range a little than the energy-line irradiation range, to have a portion narrower than the energy-line irradiation range, and to be partially formed in the cast configuration of a polymerization nature solution depending on the case. forming an energy-line irradiation configuration with masking of a desired configuration, in fabricating a porosity object in a precise configuration especially -- ** -- it is desirable It is necessary to carry out after hardening operation which cuts down a porosity object in the target configuration to neither of the cases.

[0031] In this invention, a polymerization nature solution can be arranged on two or more fields to which it became independent on the base material in a desired configuration, and two or more porosity objects can be formed on a base material by the method of performing energy-line irradiation, and the method of masking the configuration of a request to two or more independent fields, and performing energy-line irradiation, after carrying out the cast of the polymerization nature solution on a base material. When the size of the target porosity object is small, it is desirable from the field of the improvement in productivity to form two or more isomorphism-like porosity objects on a base material.

[0032] The method which carries out fixed time irradiation of the energy line, sending a base material intermittently in energy-line irradiation may be used, and you may irradiate only the residence time of the polymerization nature solution in the irradiation range, moving a base material continuously.

[0033] When a monomer and/or oligomer (A) receive the reaction prevention by oxygen on the occasion of the polymerization by energy-line irradiation, it is also desirable by irradiating an energy line under inert gas atmosphere to speed up a rate of polymerization. As for the oxygen density of inert gas atmosphere, it is desirable that it is below 5 volume %, it is still more desirable that it is below 1 volume %, and it is most desirable that it is below 0.1 volume %.

[0034] Furthermore, when a monomer and/or oligomer (A) receive the reaction prevention by oxygen on the occasion of the polymerization by energy-line irradiation, it is also desirable to speed up a rate of polymerization by removing the oxygen which is dissolving in the polymerization nature solution. Although the saturation dissolved oxygen concentration of a polymerization nature solution changes according to the kind of solution, it is desirable that it is 20 or less % of the weight of a saturation oxygen density, as for the dissolved oxygen concentration of a polymerization nature solution, it is still

more desirable that it is 5 or less % of the weight, and it is most desirable that it is 1 or less % of the weight. As a dissolved deoxidation method, arbitrary methods, such as a heat deairing method, an ultrasonic irradiation method, vacuum degassing (diaphragm vacuum degassing is also included), the bubbling method of a non-oxygen gas, and a non-oxygen gas, a contact process (a diaphragm contact process is also included) with an oxygen absorbent, are employable.

[0035] As an energy line used for the manufacture method of this invention, an electron ray, a gamma ray, an X-ray, ultraviolet rays, a visible ray, etc. can be mentioned. The simplicity of handling to equipment and ultraviolet rays are the most desirable especially. The intensity of the ultraviolet rays to irradiate is 1 - 5000 mw/cm2. It is desirable and the exposure time is a 0.01 - 90-second about room.

[0036] It is the desirable energy line which can also use an electron ray for this invention. While the width of face of these selections will spread in order not to be influenced of the existence of ****** absorption of a phase separation agent (B), other additives, etc. if an electron ray is used, the dimensional accuracy of a porosity object improves and manufacture speed also improves. Since the polymerization initiator is still more unnecessary, it is desirable when these remains pose a problem.

[0037] if an energy line is irradiated at a polymerization nature solution -- the monomer and/or oligomer (A) in a polymerization nature solution -- a polymerization -- or phase separation is carried out to a phase separation agent (B) at the same time it constructs a bridge and hardens Namely, it will be in the state where the pore section of a monomer and/or the porosity polymer of oligomer (A) was filled up with the phase separation agent (B). Therefore, of course, although a phase separation agent (B) is removed from the pore section of a porosity object in a consecutive process in the usual case, when it is a use without the need, it is not necessary to carry out.

[0038] In forming the configuration of a porosity object in the energy-line irradiation configuration of a polymerization nature solution, in a consecutive process, it also removes a non-hardened polymerization nature solution. Removal of a phase separation agent (B) and a polymerization nature solution may be performed simultaneously, and may be performed separately. All can adopt arbitrary methods, such as washing, dryness, suction, and substitution.

[0039] Moreover, when components other than a monomer and/or oligomer (A), and a phase separation agent (B) are contained in a polymerization nature solution, it joins together or adsorbs and these components may not be removed by the polymer of the case where it is removed with a phase separation agent (B), and a monomer and/or oligomer (A).

[0040] It is also possible to irradiate an energy line further after removal of a polymerization nature solution or a phase separation agent (B) (after-cure). When a porosity object needs to be especially formed in a precise configuration, after irradiating the energy line of the minimum amount required for hardening and removing an unreacted polymerization nature solution, it is desirable to perform after-cure. When other, improvement in the intensity of a porosity object or a degree of hardness can be measured with after-cure.

[0041] Moreover, it is also possible to heat-treat after removal of a phase separation agent (B). With heat treatment, grant of the dimensional stability of full removal of an unreacted monomer and a porosity object, adjustment of the pore size of a porosity object, etc. can be measured.

[0042] Although it is the configuration needed for a filter or a sensor, configurations at the bottom are a circle, a rectangular head, Kushigata, etc., and it deals in the configuration of a porosity object, for example. moreover -- typical -- the area of base of a porosity object -- 0.03-100cm2 it is .

[0043] As thickness of the porosity object formed of energy-line irradiation, it is desirable that it is 0.005-5mm. In under this range, if it becomes insufficient [intensity] and this range is exceeded, it becomes [the time which transparency or osmosis of a liquid takes] excessive and is not practical. The thickness of a porosity object is controllable by the thickness of the polymerization nature solution which arranged or carried out the cast in the desired configuration on the base material. Although based also on the kind of a monomer and/or oligomer (A), or composition of a polymerization nature solution, the thickness of the porosity object formed of energy-line irradiation usually turns into 50 - 100% of the thickness of a polymerization nature solution.

[0044] When giving a sensor function to a porosity object, a porosity object is made to fix or support what has sensor functions, such as an enzyme, a catalyst, an antibody, ****, an organelle, a microorganism, a color reagent, coloring matter, a fluorescence agent, and a chemiluminescence agent. With what has a sensor function, the matter which reacts with the matter concerning selection of the specific component in an analyte, for example, the specific component in an analyte and the matter alternatively concerning a reaction with a reactant (the so-called receptor) or the component which should be detected, the matter which inactivates matter other than the specific component in an analyte, and the matter concerning the existence of detection or the display of a grade, for example, the matter which a receptor emits, and colors is mentioned. Of course, you may serve as the plurality of these functions.

[0045] As fixation on a porosity object, or the support method, there are covalent bond, ionic bond, adsorption, adhesion, comprehension, etc. The method by covalent bond is made to carry out copolymerization of the matter which has the sensor function which introduced the vinyl group to a monomer and/or oligomer (A), or there are a double bond which exists in a porosity object, and the method of making it react in it.

[0046] Moreover, although it has the residue and sensor function of a porosity object, the amino group, an amide group, a carboxyl group, a hydroxyl group, a methoxy machine, an epoxy group, an aldehyde group, an isocyanato group, a double bond, etc. are introduced into the method to which a residue is made to react, for example, a porosity object, and there is a method combined with what has a sensor function. The porosity object which introduced ionicity bases, such as a carboxyl group and a sulfone machine, into the method by ionic bond, What has the sensor function to have ionicity residues, such as a carboxyl group There are a method of combining in a multiple-valued cation, a method by quarternary ammonium salt, etc., and the method by adsorption by hydrogen bond, the Coulomb force by polarization, Van der Waals force, etc., or adhesion The thing of suitable compatibility can be chosen with combination with what has a sensor function, a monomer, and/or oligomer (A). It is desirable to introduce the residue same on a porosity object as the case of a covalent-bond method also in the case of the method by adsorption or adhesion. As the introductory method of the residue to a porosity object, the method of using the part or the thing which presupposes all and has the target basis of a monomer and/or oligomer (A), for example, the method of carrying out after treatment of the manufactured porosity object, etc. are mentioned.

[0047] First, in order to enforce the above-mentioned fixation or the support method, although it has the above-mentioned sensor function, from inside, the component (C) which has a sensor function, and is fixed or supported by the porosity object after irradiation of an energy line can be chosen, and the method of adding this component (C) in a polymerization nature solution can be taken. This method has high productivity, and since repeatability is also good, it is a method that it is desirable the covalent bond from which a component (C) is not simultaneously removed in removal of a phase separation agent (B), ionic bond, and in physical comprehension. In adsorption, the component (C) tends to be removed simultaneously with removal of a phase separation agent (B). However, it can also be made to remain depending on the relation between compatibility with the polymer which consists of the monomer and/or oligomer (A) of this component (C), and compatibility with a polymerization nature solution or a penetrant remover.

[0048] After infiltrating what has a sensor function on the porosity object created beforehand as other fixation or the support method, the method of making it fix or support can be taken by making it react and/or dry if needed. In this case, although it has a sensor function, in advance of sinking in, a certain processing can also be added to a porosity object. Moreover, it is also possible to remove a part for needlessness by washing in advance of dryness. This method is easy not only for covalent bond, ionic bond, and a hydrogen bond method but the fixation or support by adsorption or the adhesion method, and desirable.

[0049] As what has the sensor function used for this invention Although there are especially no restrictions, if the example is given, as an example of an enzyme Alcohol oxidase, cholesterol oxidase,

LDH, and G-6- PDH, GOD, and a uricase -- Oxidoreductases, such as a catalase and a peroxidase, GOT, GPT, Transferring enzyme, such as CPK, lipase, an amylase, a chymotrypsin, a thrombin, Synthetic enzymes, such as isomerases, such as dialytic ferments, such as hydrolase, such as an urease, an arginase, and cholesterol esterase, and an aldolase, and phospho hexose isomerase, and acetyl CoA-SHINSETA-ZE, etc. can be shown.

[0050] As an antibody or an example of ****, TOREPONE-MA for syphilis sensors or false lipid ****, the blood typing matter for blood type sensors, anti-immunoglobulin G, A and M, E antibody, the AFP antibody for cancer sensors, etc. can be illustrated.

[0051] Moreover, in addition to this, microorganisms, such as organelles (organelle), such as a cell, a mitochondrion, and an epithelium organization, and mold, yeast, bacteria, an Actinomyces, can be mentioned. Of course, it is also possible to use what has the above-mentioned sensor function, compounding, for example, it is also possible to constitute a multienzyme sensor, an antibody-enzyme sensor, an enzyme-microorganism hybrid sensor, etc.

[0052] The manufacture method of the sensor of this invention is applicable also to sensors which have multilayer structure, such as a slide for polyphase film analysis of the dry-chemistry method etc. For example, if an example of the structure of the analysis slide by the spectral-analysis (colorimetric analysis) method is shown, the multilayer analysis film which consists of a four-layer lower shell, base material [of transparent plastic film], porosity body-whorl [that fixed or supported what has a sensor function], optical reflecting layer (porosity object), and expansion layer (porosity object) is stored in plastics mounting (for example, indicated in "a medical functional material, the edited by Society of Polymer Science, Japan, the Kyoritsu shuppan Co., Ltd. issue, 1990", etc.). Such multilayer structure can be formed by repeating the manufacturing process of the porosity object of the aforementioned this invention two or more times. of course, composition of the polymerization nature solution used here -- each time -- it does not need to be the same Moreover, by the manufacture method of this invention, since thickness of a polymerization nature solution can be made thin and an adhesive property is made by grant ****** by moreover choosing composition of a polymerization nature solution between layers, it is suitable for especially the formation of a sensor that has such multilayer structure.

[0053] this invention is applicable also to the sensor of an electrochemical detection method again. Arbitrarily, as usual, although how to attach an electrode can take methods, such as contact, adhesion, vacuum evaporationo, and sputtering, simultaneously with formation of a porosity object, it can also take the method of fixing an electrode to a porosity object as a method peculiar to this invention. That is, the structure united with the porosity object can be formed by irradiating the state and showy energy line which embedded the electrode in the polymerization nature solution. A metal, carbon, etc. may be the arbitrary quality of the materials, and electrodes may be arbitrary configurations, such as the shape of a tabular, a line, reticulated, and porosity. This method has high productivity compared with vacuum evaporationo or sputtering, since adhesion of an electrode and a porosity object can be ensured as compared with contact or adhesion, it becomes small with [of quality] a rose and it is suitable for especially manufacture of an electrochemistry formula sensor.

[0054] The porosity object acquired by the manufacture method of this invention is used in membrane-separation fields, such as filtration of various liquids, fractionation of a polymeric material, electrolytic removal, and filtration of various gases, and is preferably used in the field which uses a minute porosity object especially. That is, it is used in fields, such as the use which performs analysis of secrete, such as analysis of body fluid, such as the use which filters a little liquid, for example, blood etc., sweat, and saliva, and filtration and analysis of a precious research sample or an expensive sample, for example, medicine manufacture industry, a medical institution, medical checkup industry, the chemical industry, and electronic industry. Moreover, it is used in its post and engine which carry out specially the field for which the so-called multiscreen plate with which much porosity objects were formed in one underframe is used, for example, the hemanalysis.

[0055] The sensor which what has the porosity object which has the sensor function obtained by the manufacture method of this invention, and a sensor function was infiltrated, and was obtained is used

again as the existence of the specific matter and the detector of concentration, for example, a chemical sensor and a biosensor, a diagnostic drug, etc. As the measuring object, namely, for example, minerals (Na, K, P, Fe, Cl), Sugar, such as a glucose, a lipid (the total lipid, cholesterol, a neutral lipid, phospholipid, etc.), amino acid (a phenylalanine, leucine, etc.) and protein (the quality of a total protein --) Antibodies, such as hormone (an insulin, thyroid stimulating hormone, etc.), such as albumin, and an immunoglobulin, ****, false ****, a vitamin, the anti-sex matter, a medicine, the ketone body, a **** component, An urobilin body, a total nitrogen, a urea, a uric acid, ammonia, a creatinine, a creatine, Organism related substances, such as which blood, urine, sweat, a component contained in saliva, a disease germ, a virus, and a cell membrane, BOD, inflammable gas (methane, LPG, etc.), a toxic material (it SOx(es) and NOx(es)) Chemicals, such as environmental related substances, such as humidity, such as a phenol, an underwater solution gas, and acids, the taste, the olfaction matter, etc. are mentioned. as a use purpose The analysis for a diagnosis and the analysis for treatment, for example, a pregnancy diagnosis, various infection diagnoses, a cancer diagnosis, The others which are an immune disorder disorder, an autoimmune disease diagnosis, a hepatitis diagnosis, a liver, a renal-function diagnosis, etc., Operation controls, such as a monitor of living body activity and an artificial organ, environmental measurement, environmental control, disaster prevention, operation of various processes, management, control, etc. are mentioned, and as an industrial field used For example, a medical institution, medical checkup industry, medicine manufacture industry, the chemical industry, a food stuff industry, the electrical and electric equipment and electronic industry, machine industry, engineering industry, defense / disaster prevention industry, etc. are mentioned. Also in the case of the use as a sensor, when an analyte is little, it sets, and it is especially used for it preferably. [as well as the case of the use as the above-mentioned filtration membrane]

[0056]

[Example] Hereafter, although an example explains this invention still more concretely, thereby, the range of this invention is not limited. In addition, all the sections in an example are weight criteria.

[0057] The 0.5 sections, the isopropyl alcohol 120 section, and the water 50 section were mixed for the urethane acrylate oligomer 35 section which averages in 1 molecule with the [example 1] weight average molecular weight 2000, and has three acrylic machines, 1, the 6-hexanediol diacrylate 60 section, the acrylamide 5 section, and IRUGAKYUA 651 (the product made from Ciba-Geigy, ultraviolet-rays polymerization initiator), and the polymerization nature solution (1) was obtained.

[0058] By the film applicator, on the glass plate, the cast of the polymerization nature solution (1) was carried out so that thickness might change with 100 micrometers. It masks with the metal plate with a thickness of 0.08mm which the hole with a diameter of 5mm was moreover able to open at intervals of [10x10] 15mm, and, for wavelength, intensity is 2mW [100 //cm] at 360nm by the metal halide lamp. Ultraviolet rays were irradiated for 60 seconds. Before irradiation, it was observed in after transparent cast liquid's irradiating that only the irradiation section is changing to opalescence. Subsequently, after washing a glass plate by water and ethanol, it dried, the porosity object of opalescence was exfoliated from the glass plate, and the porosity object with a diameter [of 5mm] and a thickness of about 90 micrometers was acquired. According to the electron microscope, the polymer particle pasted up mutually and pore with a diameter of about 1 micrometer given as the gap were observed. Pore size and the pore configuration were almost the same in every position in the front face and film cross section of a porosity poly membrane.

[0059] It averages in 1 molecule with the [example 2] molecular weight 800. The 0.2 sections, the polyethylene-glycol (average molecular weight 400) 120 section, and the water 30 section were mixed for the urethane acrylate oligomer 25 section which has three acrylic machines, 1, the 6-hexanediol diacrylate 50 section, the n-butyl acrylate 20 section, the ARONIKUSU M-5400 [single organic-functions monomer which has product [made from Toagosei Chemistry], and carboxyl group] 5 section, and IRUGAKYUA 651, and the polymerization nature solution (2) was obtained.

[0060] A polymerization nature solution (2) is screen-stenciled in the configuration by which the round shape with a diameter of 5mm has been arranged at intervals of [10x10] 15mm on the base material of

a polyethylene terephthalate (PET) sheet, and, for wavelength, intensity is 100 mW/cm2 at 360nm by the metal halide lamp. Ultraviolet rays were irradiated for 60 seconds. Before irradiation, after irradiation, the transparent paint film with a diameter of about 5mm changed to opalescence, and had hardened. Subsequently, after an acetone and water washed the hardened material the whole base material, it dried and the porosity object with a diameter [of 5mm] and a thickness of about 110 micrometers pasted up on the base material was acquired. According to the electron microscope, the polymer particle pasted up mutually and pore with a diameter of about 0.6 micrometers given as the gap were observed.
[0061] The urethane acrylate oligomer 60 section which averages in 1 molecule with the [example 3] molecular weight 800, and has three acrylic machines, 1, the 6-hexanediol diacrylate 40 section, the IRUGA cure-6510.3 section, the Tween 80 [product [made from Kanto Chemistry] and Nonion system surfactant] 120 section, and the water 30 section were mixed, and the polymerization nature solution (3) with a viscosity [in 23 degrees C] of 400cps was obtained.
[0062] On a poly ethylene tetrafluoride (PTFE) film, the cylinder with the bore of 5mm, an outer diameter [of 6mm], and a length of 3mm made from polystyrene (PS) is placed perpendicularly, about 4mg polymerization nature solution 3 is poured in into it, and, for wavelength, intensity is 100 mW/cm2 at 360nm by the metal halide lamp. Ultraviolet rays were irradiated for 60 seconds. Before irradiation, in after the transparent polymerization nature solution's irradiating, it changed to opalescence and had hardened. Subsequently, after it removed the hardened material from on the PTFE film the whole cylinder made from PS and ethanol and water washed, it dried and the porosity object with a thickness of about 180 micrometers really fabricated by the base of the cylinder made from PS was acquired. The polymer particle which pasted up this porosity object of each other according to the electron microscope, and pore with a diameter of about 1 micrometer given as the gap were observed. Pore size and the pore configuration were almost the same in every position in the front face and film cross section of a porosity poly membrane.
[0063] It is ** masking vacuum deposition on the sheet made from [example 4] polyethylene terephthalate. one pair of carbon electrodes of 1mm of inter-electrode gaps -- 5x5 pieces -- forming -- ** -- on each, the polymerization nature solution (4) which added the glucose oxidase 0.1 section by screen-stencil in a polymerization nature solution (2), with a diameter of 6mm after allotting circularly Ultraviolet rays are irradiated. a polymerization nature solution (1) by screen-stencil on it [**], respectively With a diameter of 10mm after allotting circularly, ** It masked so that only the portion of the formed porosity object might irradiate, ultraviolet rays were irradiated, and after washing and drying in ** water and ethanol, 25 sensor intermediate fields were obtained by cutting ** base material.
[0064] 25 biosensors were formed by pasting up what ferry SHINAN-ized potassium solution was infiltrated into the porosity object with a thickness of about 180 micrometers really fabricated by the base of the cylinder made from PS which manufactured like the ** example 3 on the other hand 0.1% of the weight, and was dried on the sensor intermediate field obtained by ** in the epoxy resin only in the periphery section of ** porosity object. The thickness of the porous layer in which the thickness of the porous layer formed from the polymerization nature solution (4) of the obtained biosensor was formed from 55 micrometers and the polymerization nature solution (1) was 40 micrometers.
[0065] When the current measuring machine was connected to the carbon electrode of the sensor formed as mentioned above using the carbon paste and point arrival of the whole blood was carried out to the cylinder, the current according to the glucose concentration in blood was measured. When the same sample was measured by 20 sensors, coefficient of variation was as small as 4.7%.
[0066] the sheet top made from [example 5] polyethylene terephthalate -- ** masking vacuum deposition -- one pair of carbon electrodes of 1mm of inter-electrode gaps -- 5x5 pieces -- forming -- ** -- on each, a polymerization nature solution (2) is irradiated by screen-stencil, and ultraviolet rays are irradiated, with a diameter of 6mm after allotting circularly Then, after washing in water and ethanol, infiltrating the 0.01 % of the weight solution of ** glucose oxidases and incubating for 10 minutes at 40 degrees C, where a porosity object is infiltrated, ** water A polymerization nature solution (1) by screen-stencil on a porosity object, respectively With a diameter of 10mm after allotting circularly, **

After having masked so that only the portion of the formed porosity object might irradiate, irradiating ultraviolet rays and washing and drying in ** water and ethanol, ** base material was cut and 25 sensor intermediate fields were obtained.

[0067] 25 biosensors were formed by pasting up what ferry SHINAN-ized potassium solution was infiltrated into the porosity object with a thickness of about 180 micrometers really fabricated by the base of the cylinder made from PS which manufactured like the ** example 3 on the other hand 0.1% of the weight, and was dried on the sensor intermediate field obtained by ** in the epoxy resin only in the periphery section of ** porosity object. The thickness of the porous layer in which the thickness of the porous layer formed from the polymerization nature solution (2) of the obtained biosensor was formed from 55 micrometers and the polymerization nature solution (1) was 40 micrometers.

[0068] When the current measuring machine was connected to the carbon electrode of the sensor formed as mentioned above using the carbon paste and point arrival of the whole blood was carried out to the cylinder, the current according to the glucose concentration in blood was measured. When the same sample was measured by 20 sensors, coefficient of variation was as small as 5.4%.

[0069]

[Effect of the Invention] In manufacturing the device by which the porosity object and the minute porosity object of a minute configuration were incorporated especially, for example, a sensor, according to the manufacture method of this invention, handling and adhesion of a minute porosity object become unnecessary, improvement in productivity and the suppression with the rose of a performance can be measured, and mechanization of a manufacturing process becomes easy. Moreover, since much porosity objects can be manufactured simultaneously, the remarkable improvement in productivity can be measured.

[Translation done.]

* NOTICES *

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TECHNICAL FIELD

[Industrial Application] this invention relates to the manufacture method of the porosity object which makes a porous membrane the representation, the method of manufacturing the porosity object of a desired size and configuration, and the manufacture method of the sensor which makes a component the porosity object manufactured by this method, without starting in more detail using energy-line hardening resin.

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PRIOR ART

[Description of the Prior Art] When filtering with the porosity object of a minute configuration, generally the porosity object is used in the configuration united with the frame or the container. Moreover, the so-called multiscreen plate with which much porosity objects were formed in one underframe for the purpose of the improvement in efficiency of filtration and analysis is used.
[0003] In sensors, such as a chemical sensor and a biosensor A porosity object is incorporated [**** /, for the purpose of transportation (expansion) of the sample liquid object by capillarity, or] by filtration for the purpose of absorption of an excessive sample liquid object for the purpose of making a color reagent, an enzyme, an antibody, ****, a catalyst, an organelle, a microorganism, etc. hold, and giving itself a sensor function for the purpose of removing or intercepting the obstruction of analysis in an analyte.
[0004] In manufacturing the filter and sensor which make such a porosity object a part [the component], it was a usual state to create the porosity object of a large area beforehand until now, to start it in required size and configuration by methods, such as punching, and to fix to the appropriate part of a filter or a sensor by methods, such as adhesion.

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EFFECT OF THE INVENTION

[Effect of the Invention] In manufacturing the device by which the porosity object and the minute porosity object of a minute configuration were incorporated especially, for example, a sensor, according to the manufacture method of this invention, handling and adhesion of a minute porosity object become unnecessary, improvement in productivity and the suppression with the rose of a performance can be measured, and mechanization of a manufacturing process becomes easy. Moreover, since much porosity objects can be manufactured simultaneously, the remarkable improvement in productivity can be measured.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, in order to miniaturize a filter and a sensor or to make detection possible with a little sample, it is necessary to make the size of a porosity object small. However, when it was going to make the size of a porosity object small even for especially millimeter order, various problems had arisen. For example, when the porosity object of a request configuration was pierced from the porosity object of a large area, the defect of the letter of a crack tended to occur around near the cutting section (i.e., a porosity object), and it had become a problem, so that the size of a porosity object was made small. Moreover, very precise work was needed for handling and adhesion of a porosity object of a minute configuration, and not only the fall of productivity but the fall of a rose and the yield of a performance was caused.

[Translation done.]

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MEANS

[Means for Solving the Problem] Also in the case of a minute configuration, the yield of this invention person etc. is good with high degree of accuracy in the porosity object which constitutes a filter and a sensor. And as a result of examining how to have and manufacture for high productivity wholeheartedly, the energy-line hardening resin of the specific composition for porosity object manufacture is used. If it masks and an energy line is irradiated after irradiating an energy line after allotting the configuration of a request on a base material, or carrying out the cast on a base material The porosity object which could manufacture the porosity object of a desired size and configuration, without starting, and was manufactured remains as it is. Or it finds out that various kinds of sensors by making this fix or support the component which has sensor functions, such as an antigen, an antibody, an enzyme, a catalyst, and a microorganism, can be manufactured, and came to complete this invention.

[0007] That is, this invention offers the manufacture method of the sensor characterized by making it fix or support, after infiltrating the component (C) characterized by providing the following. They are the monomer in which a polymerization is possible, and/or oligomer (A) by irradiation of an energy line. It does not dissolve with the polymer generated by dissolving with this monomer and/or oligomer (A), and irradiating an energy line at these monomers and/or oligomer (A). And the uniform polymerization nature solution which mixed the inactive phase separation agent (B) to the energy line It is a sensor function to the manufacture method of the porosity object characterized by irradiating an energy line where a desired configuration is masked after irradiating an energy line after allotting the configuration of a request on a base material, or carrying out the cast on a base material, and the porosity object acquired by this manufacture method.

[0008] In addition, the sensor obtained by the manufacture method of this invention may be a sensor of arbitrary methods, such as what is detected by what is depended on what is depended on electrochemical detection, for example, a POTENSHOMETORI-method, and an amperometry method and the thing to depend on a colorimetry method, for example, coloring, fading, and hue change, a thing to depend on fluorescence luminescence or a fluorescence quenching method, and a thing to depend on a chemiluminescence.

[0009] Hereafter, this invention is further explained to a detail. As the monomer and/or oligomer (A) which are used for this invention That what is necessary is just the object which does not ask organic and inorganic, but carries out a polymerization by irradiation of an energy line, and serves as polymer Although radical polymerization nature, anionic polymerization nature, cationic polymerization nature, etc. may be arbitrary things, what has 1-6 vinyl groups, an acrylic machine, meta-acrylic machines, and those mixture in 1 molecule is desirable, and what has a rate of polymerization quick especially by irradiation of an energy line is desirable.

[0010] As a monomer used for the above-mentioned this invention, for example Ethyl (meta) acrylate, Hydroxyethyl (meta) acrylate, hydroxypropyl (meta) acrylate, n-butyl (meta) acrylate, hexyl (meta) acrylate, 2-ethylhexyl (meta) acrylate, phenyl (meta) acrylate, Phenyl cellosolve (meta) acrylate, n-vinyl pyrrolidone, Isobornyl (meta) acrylate, JISHIKURO pentenyl (meta) acrylate, Dicyclopentenyloxy ether

(meta) acrylate, an acrylamide, Single organic-functions monomers, such as N-alkyl acrylamide, diethylene GURIKORUJI (meta) acrylate, Neopentyl GURIKORUJI (meta) acrylate, 1, 6-hexane JIORUJI (meta) acrylate, A polyethylene GURIKORUJI (meta) acrylate, 2, and 2'-screw (4-(meth)acryloyloxy polyethyleneoxy phenyl) propane, 2 organic-functions monomers, such as a 2 and 2'-screw (4-(meth)acryloyloxy polypropyleneoxy phenyl) propane, 3 organic-functions monomers, such as TORIMECHI roll pro pantry (meta) acrylate and trimethylolethane tri(metha)acrylate, 6 organic-functions monomers, such as 4 organic-functions monomers, such as pentaerythritol tetrapod (meta) acrylate, and dipentaerythritol hexaacrylate, etc. are mentioned. Of course, it is also possible to mix and use these monomers.

[0011] As oligomer used for this invention, a polymerization is possible at energy-line irradiation, the thing of 500-50000 is mentioned and weight average molecular weight can mention the polyurethane resin which specifically has an acrylic machine or an methacrylic machine at the acrylic ester of an epoxy resin or a methacrylic ester, the acrylic ester of a polyether resin or a methacrylic ester, the acrylic ester of a polybutadiene resin or a methacrylic ester, and the molecule end, for example. Of course, it can also mix and use, and it can mix with a monomer and these oligomer can also be used.

[0012] It is desirable that it is that to which the monomer and/or oligomer (A) in which a polymerization is possible make a principal component the monomer and/or oligomer of an acrylic-acid system with a quick rate of polymerization or an acrylic-ester system in these by irradiation of an energy line, for example, it is desirable that it is what is contained 50% of the weight or more in a monomer and/or oligomer (A). Moreover, since improvement in intensity, the improvement in a dimensional accuracy, and suppression of a dimensional change with time can be measured by introduction of the structure of cross linkage, it is desirable that it is what contains the thing more than a kind chosen from the group which the monomer and/or oligomer of an acrylic-acid system or an acrylic-ester system become from 2, 3, 4, 5, or 6 organic functions 50% of the weight or more. Furthermore, since a hydrophilic or water-repellent porosity object is acquired according to the use purpose, the raw material containing hydrophobic radicals containing hydrophilic groups and hydrophilic parts, such as a hydroxyl group, a carboxyl group, an amino group, an ammonium salt, amide combination, and ether linkage, such as a raw material, a fluorine, and a silyl machine, etc. can be chosen suitably, and it can also add.

[0013] It may not dissolve with the polymer generated when it dissolves as a phase separation agent (B) used for this invention with the monomer and/or oligomer (A) which are used for this invention and these monomers and/or oligomer (A) receive irradiation of an energy line, but what thing may be used as long as it is moreover inactive to an energy line.

[0014] It is necessary to dissolve substantially a phase separation agent (B), a monomer, and/or oligomer (A) uniformly at the time of energy-line irradiation, and in this invention, if an energy line is irradiated in the state where phase separation has arisen, the big closed cell of 10 micrometers or more of apertures will not occur, or a porosity object will not be formed.

[0015] Although the compatibility with a phase separation agent (B), a monomer, and/or oligomer (A) changes at various conditions and the temperature of the polymerization nature solution which contains these especially, it may change also according to the kind of a monomer and/or oligomer (A).

[0016] for example, in using for a molecule end the polyurethane resin which has an acrylic machine as polymerization nature oligomer As a phase separation agent (B), a methyl caprate, an ethyl caprate, a methyl laurate, Alkyl ester, such as a caprylic-acid methyl, an ethyl caprylate, and a diisobutyl adipate Dialkyl ketones, such as a diisobutyl ketone, alcohols, a liquefied polyethylene glycol, The monoester of a polyethylene glycol, and polyethylene-glycol sorbitan ester The poly ethylene glycol monoether, the monochrome of a glycerol, JI, and triester, The alkyl ester which has a hydroxyl group, alkylamines, and a polyethylene-glycol amine, Other surfactants etc. can use suitably mixture with more than these kinds and water further. Especially The monoester of a liquefied polyethylene glycol and a polyethylene glycol, Polyethylene-glycol sorbitan ester, the poly ethylene glycol monoether, The monochrome, JI, and TORI of a glycerol Alkyl esthetic which has ester and a hydroxyl group If RU, alkylamines, or a polyethylene-glycol amine is used Since viscosity of a polymerization nature solution can be made high,

without reducing the solubility of a monomer and/or oligomer (A), Especially since the polymer which deposited by irradiation of an energy line tends to become mesh-like and the intensity of a porosity object becomes high while the condition range which can manufacture a porosity object becomes large, it is desirable.

[0017] It may dissolve in a liquefied monomer and/or liquefied oligomer (A), and as long as the phase separation agent (B) which can be used for this invention is inactive to energy-line irradiation, it may be a solid-state, for example, polymer. For example, cellulose acetate, an ethyl cellulose, a nitrocellulose, chitosan, polystyrene, a polyvinyl chloride, a polycarbonate, a polysulfone, polyether sulphone, polyurethane, a polyacrylonitrile, polyacrylic ester, a polyacrylic acid, a polymethylmethacrylate, a polyacrylamide, a polyethylene glycol, a polyvinyl pyrrolidone, polyvinyl alcohol, etc. these derivatives, and a copolymer can be illustrated, and a polyethylene glycol and a polyvinyl pyrrolidone are desirable especially. Of course, polymer may be two or more polymer. A phase separation agent (B) may be a polymer solution again.

[0018] A phase separation agent (B) may be single composition, and may be mixture. In the case of mixture, it does not dissolve with the polymer generated when it dissolves with the monomer and/or oligomer (A) which the mixture itself uses for this invention and these monomers and/or oligomer (A) receive irradiation of an energy line, and moreover, to an energy line, if inactive, what thing may be used and especially a character component independent [the] will not be limited. For example, each component may be an object in which it does not dissolve with a monomer and/or oligomer, and it is not dissolved [also swell the polymer or], and may be dissolved with the polymer conversely generated from a monomer and/or oligomer (A).

[0019] A phase separation agent (B) can be suitably chosen with the solubility of the difference in the manufacture method of a porosity object, a monomer and/or the kind of oligomer (A), the viscosity of the polymerization nature solution needed, and the additive of polymer and others, an aperture, a configuration of pore needed for a porosity object, etc.

[0020] However, as for a phase separation agent (B), it is desirable in these that it is a nonvolatile liquid. When a phase separation agent (B) is an volatile liquid, the precise layer with a detailed aperture tends to be formed in the front face of a porosity object, and removal tends to become inefficient when a phase separation agent (B) is a solid-state. Moreover, when using ultraviolet rays as an energy line, as for a phase separation agent (B), what has a few ultraviolet absorption is desirable.

[0021] About the ratio to the monomer and/or oligomer (A) of a phase separation agent (B), since the range of the 0.1 - 4.0 weight section becomes [the voidage of a porosity object] low too much and is suitable, voidage moreover becomes high too much to a monomer and/or the (Oligomer A) 1 weight section and there is no bird clapper that intensity is inadequate, it is desirable.

[0022] The aperture of the pore of a porosity object is dependent on division doubling of others, a monomer and/or oligomer (A), and a phase separation agent (B). [mixing ratio / of a monomer and/or oligomer (A), and a phase separation agent (B)] Generally, the case where the mixing ratio of a phase separation agent (B) is high, when the compatibility of a monomer and/or oligomer (A), and a phase separation agent (B) is bad, or when the viscosity of a polymerization nature solution is low, as for the relation, an aperture becomes large. The quality of the compatibility of a monomer and/or oligomer (A), and a phase separation agent (B) reduces the temperature of mixed liquor gradually, goes, and can be judged at the temperature which phase separation produces. Compatibility is so good that phase separation temperature is low. In this invention, it is desirable by selecting suitable conditions to form the pore of 0.01-5 micrometers of apertures. Although it is possible to also form the aperture below this range or beyond this range, the fall of the osmosis speed of a sample arises or it is easy to produce the fall of dimensional stability etc.

[0023] In the polymerization nature solution used for this invention, it is also possible to contain other components besides a monomer and/or oligomer (A), and a phase separation agent (B). for example, a sensor function -- having -- and the porosity after irradiation of an energy line -- the component (C) fixed or supported, an ultraviolet-rays polymerization initiator, etc. are mentioned to the inside of the body

When using ultraviolet rays as an energy line, it is desirable to make a polymerization nature solution contain an ultraviolet-rays polymerization initiator in order to speed up a rate of polymerization.
[0024] As an ultraviolet-rays polymerization initiator used here Although there is no need of preparing especially restrictions, it is necessary to choose the object which can dissolve in a polymerization nature solution. For example, a p-tert-BUCHIRUTORI chloroacetophenone, 2, and 2'-diethoxy acetophenone, 2-hydroxy-2-methyl-1-phenyl propane -1-ON, The acetophenones of **; A benzophenone, 4, and 4'-bisdimethyl amino benzophenone, 2-chloro thioxan ton, 2-methylthio xanthone, 2-ethyl thioxan ton, Ketones, such as 2-isopropyl thioxan ton; A benzoin, a benzoin methyl ether, Benzoin ether, such as benzoin iso-propyl ether and benzoin isobutyl ether; benzyl ketals, such as a benzyl dimethyl ketal and a hydroxy cyclohexyl phenyl ketone, can be mentioned.
[0025] The base material used for this invention may be held in the fixed configuration between energy-line irradiation in a polymerization nature solution, and may unite with the case where it is used for the use purpose of a porosity object, exfoliating finally, and a porosity object.
[0026] Base materials may be the case where it is the nonvesicular matter, and the porosity matter again. As nonvesicular matter, there are semiconductor products, such as a polymer film, polymer mold goods, a metal plate, a glass plate, a semiconductor and also a transistor, and diode, etc., for example. The polymer moldings which has the crest which classifies two or more porosity objects formed of energy-line irradiation as an example of the nonvesicular base material united with the porosity object fabricated by energy-line irradiation, a porosity object, the polymer film of a material to paste up, etc. are mentioned. Moreover, as an example of the base material of the porosity matter, a nonwoven fabric, filter paper, cloth, a network, etc. are mentioned. In the case of these porosity base materials, it usually unites with the porosity object manufactured.
[0027] A base material may be the independent film-like object and the independent tabular object, and may be a continuum. When a base material is a porosity object and really fabricated, a base material can also be cut after porosity object fabrication.
[0028] After carrying out the cast of the method of irradiating an energy line and stiffening a polymerization nature solution, after arranging ** polymerization nature solution on the configuration of a request on a base material as the manufacture method of this invention, or the ** polymerization nature solution on a base material, a desired configuration is masked (it contains, when irradiating a masking pattern through a lens system), an energy line is irradiated, and the method of stiffening a polymerization nature solution is mentioned.
[0029] That is, the configuration of the porosity object fabricated by the method of ** by energy-line irradiation can form a polymerization nature solution in a configuration [having allotted the desired configuration by methods, such as printing, dropping, and pouring,] on a base material. Moreover, it is also possible to arrange a mold and a frame on a base material, and to drop or pour in a polymerization nature solution within the mold and limit.
[0030] Moreover, the configuration of the porosity object fabricated by the method of ** by energy-line irradiation can be formed in the energy-line irradiation configuration of a polymerization nature solution. In this case, the configuration of a porosity object is able for the cast to the base material top of a polymerization nature solution to go to the whole base material top surface, and to be a larger range a little than the energy-line irradiation range, to have a portion narrower than the energy-line irradiation range, and to be partially formed in the cast configuration of a polymerization nature solution depending on the case. forming an energy-line irradiation configuration with masking of a desired configuration, in fabricating a porosity object in a precise configuration especially -- ** -- it is desirable It is necessary to carry out after hardening operation which cuts down a porosity object in the target configuration to neither of the cases.
[0031] In this invention, a polymerization nature solution can be arranged on two or more fields to which it became independent on the base material in a desired configuration, and two or more porosity objects can be formed on a base material by the method of performing energy-line irradiation, and the method of masking the configuration of a request to two or more independent fields, and performing

energy-line irradiation, after carrying out the cast of the polymerization nature solution on a base material. When the size of the target porosity object is small, it is desirable from the field of the improvement in productivity to form two or more isomorphism-like porosity objects on a base material.
[0032] The method which carries out fixed time irradiation of the energy line, sending a base material intermittently in energy-line irradiation may be used, and you may irradiate only the residence time of the polymerization nature solution in the irradiation range, moving a base material continuously.
[0033] When a monomer and/or oligomer (A) receive the reaction prevention by oxygen on the occasion of the polymerization by energy-line irradiation, it is also desirable by irradiating an energy line under inert gas atmosphere to speed up a rate of polymerization. As for the oxygen density of inert gas atmosphere, it is desirable that it is below 5 volume %, it is still more desirable that it is below 1 volume %, and it is most desirable that it is below 0.1 volume %.
[0034] Furthermore, when a monomer and/or oligomer (A) receive the reaction prevention by oxygen on the occasion of the polymerization by energy-line irradiation, it is also desirable to speed up a rate of polymerization by removing the oxygen which is dissolving in the polymerization nature solution. Although the saturation dissolved oxygen concentration of a polymerization nature solution changes according to the kind of solution, it is desirable that it is 20 or less % of the weight of a saturation oxygen density, as for the dissolved oxygen concentration of a polymerization nature solution, it is still more desirable that it is 5 or less % of the weight, and it is most desirable that it is 1 or less % of the weight. As a dissolved deoxidation method, arbitrary methods, such as a heat deairing method, an ultrasonic irradiation method, vacuum degassing (diaphragm vacuum degassing is also included), the bubbling method of a non-oxygen gas, and a non-oxygen gas, a contact process (a diaphragm contact process is also included) with an oxygen absorbent, are employable.
[0035] As an energy line used for the manufacture method of this invention, an electron ray, a gamma ray, an X-ray, ultraviolet rays, a visible ray, etc. can be mentioned. The simplicity of handling to equipment and ultraviolet rays are the most desirable especially. The intensity of the ultraviolet rays to irradiate is 1 - 5000 mw/cm2. It is desirable and the exposure time is a 0.01 - 90-second about room.
[0036] It is the desirable energy line which can also use an electron ray for this invention. While the width of face of these selections will spread in order not to be influenced of the existence of ****** absorption of a phase separation agent (B), other additives, etc. if an electron ray is used, the dimensional accuracy of a porosity object improves and manufacture speed also improves. Since the polymerization initiator is still more unnecessary, it is desirable when these remains pose a problem.
[0037] if an energy line is irradiated at a polymerization nature solution -- the monomer and/or oligomer (A) in a polymerization nature solution -- a polymerization -- or phase separation is carried out to a phase separation agent (B) at the same time it constructs a bridge and hardens Namely, it will be in the state where the pore section of a monomer and/or the porosity polymer of oligomer (A) was filled up with the phase separation agent (B). Therefore, of course, although a phase separation agent (B) is removed from the pore section of a porosity object in a consecutive process in the usual case, when it is a use without the need, it is not necessary to carry out.
[0038] In forming the configuration of a porosity object in the energy-line irradiation configuration of a polymerization nature solution, in a consecutive process, it also removes a non-hardened polymerization nature solution. Removal of a phase separation agent (B) and a polymerization nature solution may be performed simultaneously, and may be performed separately. All can adopt arbitrary methods, such as washing, dryness, suction, and substitution.
[0039] Moreover, when components other than a monomer and/or oligomer (A), and a phase separation agent (B) are contained in a polymerization nature solution, it joins together or adsorbs and these components may not be removed by the polymer of the case where it is removed with a phase separation agent (B), and a monomer and/or oligomer (A).
[0040] It is also possible to irradiate an energy line further after removal of a polymerization nature solution or a phase separation agent (B) (after-cure). When a porosity object needs to be especially formed in a precise configuration, after irradiating the energy line of the minimum amount required for

hardening and removing an unreacted polymerization nature solution, it is desirable to perform after-cure. When other, improvement in the intensity of a porosity object or a degree of hardness can be measured with after-cure.

[0041] Moreover, it is also possible to heat-treat after removal of a phase separation agent (B). With heat treatment, grant of the dimensional stability of full removal of an unreacted monomer and a porosity object, adjustment of the pore size of a porosity object, etc. can be measured.

[0042] Although it is the configuration needed for a filter or a sensor, configurations at the bottom are a circle, a rectangular head, Kushigata, etc., and it deals in the configuration of a porosity object, for example. moreover -- typical -- the area of base of a porosity object -- 0.03-100cm2 it is .

[0043] As thickness of the porosity object formed of energy-line irradiation, it is desirable that it is 0.005-5mm. In under this range, if it becomes insufficient [intensity] and this range is exceeded, it becomes [the time which transparency or osmosis of a liquid takes] excessive and is not practical. The thickness of a porosity object is controllable by the thickness of the polymerization nature solution which arranged or carried out the cast in the desired configuration on the base material. Although based also on the kind of a monomer and/or oligomer (A), or composition of a polymerization nature solution, the thickness of the porosity object formed of energy-line irradiation usually turns into 50 - 100% of the thickness of a polymerization nature solution.

[0044] When giving a sensor function to a porosity object, a porosity object is made to fix or support what has sensor functions, such as an enzyme, a catalyst, an antibody, ****, an organelle, a microorganism, a color reagent, coloring matter, a fluorescence agent, and a chemiluminescence agent. With what has a sensor function, the matter which reacts with the matter concerning selection of the specific component in an analyte, for example, the specific component in an analyte and the matter alternatively concerning a reaction with a reactant (the so-called receptor) or the component which should be detected, the matter which inactivates matter other than the specific component in an analyte, and the matter concerning the existence of detection or the display of a grade, for example, the matter which a receptor emits, and colors is mentioned. Of course, you may serve as the plurality of these functions.

[0045] As fixation on a porosity object, or the support method, there are covalent bond, ionic bond, adsorption, adhesion, comprehension, etc. The method by covalent bond is made to carry out copolymerization of the matter which has the sensor function which introduced the vinyl group to a monomer and/or oligomer (A), or there are a double bond which exists in a porosity object, and the method of making it react in it.

[0046] Moreover, although it has the residue and sensor function of a porosity object, the amino group, an amide group, a carboxyl group, a hydroxyl group, a methoxy machine, an epoxy group, an aldehyde group, an isocyanato group, a double bond, etc. are introduced into the method to which a residue is made to react, for example, a porosity object, and there is a method combined with what has a sensor function. The porosity object which introduced ionicity bases, such as a carboxyl group and a sulfone machine, into the method by ionic bond, What has the sensor function to have ionicity residues, such as a carboxyl group There are a method of combining in a multiple-valued cation, a method by quarternary ammonium salt, etc., and the method by adsorption by hydrogen bond, the Coulomb force by polarization, Van der Waals force, etc., or adhesion The thing of suitable compatibility can be chosen with combination with what has a sensor function, a monomer, and/or oligomer (A). It is desirable to introduce the residue same on a porosity object as the case of a covalent-bond method also in the case of the method by adsorption or adhesion. As the introductory method of the residue to a porosity object, the method of using the part or the thing which presupposes all and has the target basis of a monomer and/or oligomer (A), for example, the method of carrying out after treatment of the manufactured porosity object, etc. are mentioned.

[0047] First, in order to enforce the above-mentioned fixation or the support method, although it has the above-mentioned sensor function, from inside, the component (C) which has a sensor function, and is fixed or supported by the porosity object after irradiation of an energy line can be chosen, and the

method of adding this component (C) in a polymerization nature solution can be taken. This method has high productivity, and since repeatability is also good, it is a method that it is desirable the covalent bond from which a component (C) is not simultaneously removed in removal of a phase separation agent (B), ionic bond, and in physical comprehension. In adsorption, the component (C) tends to be removed simultaneously with removal of a phase separation agent (B). However, it can also be made to remain depending on the relation between compatibility with the polymer which consists of the monomer and/or oligomer (A) of this component (C), and compatibility with a polymerization nature solution or a penetrant remover.

[0048] After infiltrating what has a sensor function on the porosity object created beforehand as other fixation or the support method, the method of making it fix or support can be taken by making it react and/or dry if needed. In this case, although it has a sensor function, in advance of sinking in, a certain processing can also be added to a porosity object. Moreover, it is also possible to remove a part for needlessness by washing in advance of dryness. This method is easy not only for covalent bond, ionic bond, and a hydrogen bond method but the fixation or support by adsorption or the adhesion method, and desirable.

[0049] As what has the sensor function used for this invention Although there are especially no restrictions, if the example is given, as an example of an enzyme Alcohol oxidase, cholesterol oxidase, LDH, and G-6- PDH, GOD, and a uricase -- Oxidoreductases, such as a catalase and a peroxidase, GOT, GPT, Transferring enzyme, such as creatine phosphokinase, lipase, an amylase, a chymotrypsin, a thrombin, Synthetic enzymes, such as isomerases, such as dialytic ferments, such as hydrolase, such as an urease, an arginase, and cholesterol esterase, and an aldolase, and phospho hexose isomerase, and acetyl CoA-synthetase, etc. can be shown.

[0050] As an antibody or an example of ****, TOREPONE-MA for syphilis sensors or false lipid ****, the blood typing matter for blood type sensors, anti-immunoglobulin G, A and M, E antibody, the AFP antibody for cancer sensors, etc. can be illustrated.

[0051] Moreover, in addition to this, microorganisms, such as organelles (organelle), such as a cell, a mitochondrion, and an epithelium organization, and mold, yeast, bacteria, an Actinomyces, can be mentioned. Of course, it is also possible to use what has the above-mentioned sensor function, compounding, for example, it is also possible to constitute a multienzyme sensor, an antibody-enzyme sensor, an enzyme-microorganism hybrid sensor, etc.

[0052] The manufacture method of the sensor of this invention is applicable also to sensors which have multilayer structure, such as a slide for polyphase film analysis of the dry-chemistry method etc. For example, if an example of the structure of the analysis slide by the spectral-analysis (colorimetric analysis) method is shown, the multilayer analysis film which consists of a four-layer lower shell, base material [of transparent plastic film], porosity body-whorl [that fixed or supported what has a sensor function], optical reflecting layer (porosity object), and expansion layer (porosity object) is stored in plastics mounting (for example, indicated in "a medical functional material, the edited by Society of Polymer Science, Japan, the Kyoritsu shuppan Co., Ltd. issue, 1990", etc.). Such multilayer structure can be formed by repeating the manufacturing process of the porosity object of the aforementioned this invention two or more times. of course, composition of the polymerization nature solution used here -- each time -- it does not need to be the same Moreover, by the manufacture method of this invention, since thickness of a polymerization nature solution can be made thin and an adhesive property is made by grant ****** by moreover choosing composition of a polymerization nature solution between layers, it is suitable for especially the formation of a sensor that has such multilayer structure.

[0053] this invention is applicable also to the sensor of an electrochemical detection method again. Arbitrarily, as usual, although how to attach an electrode can take methods, such as contact, adhesion, vacuum evaporationo, and sputtering, simultaneously with formation of a porosity object, it can also take the method of fixing an electrode to a porosity object as a method peculiar to this invention. That is, the structure united with the porosity object can be formed by irradiating the state and showy energy line which embedded the electrode in the polymerization nature solution. A metal, carbon, etc. may be the

arbitrary quality of the materials, and electrodes may be arbitrary configurations, such as the shape of a tabular, a line, reticulated, and porosity. This method has high productivity compared with vacuum evaporationo or sputtering, since adhesion of an electrode and a porosity object can be ensured as compared with contact or adhesion, it becomes small with [of quality] a rose and it is suitable for especially manufacture of an electrochemistry formula sensor.

[0054] The porosity object acquired by the manufacture method of this invention is used in membrane-separation fields, such as filtration of various liquids, fractionation of a polymeric material, electrolytic removal, and filtration of various gases, and is preferably used in the field which uses a minute porosity object especially. That is, it is used in fields, such as the use which performs analysis of secrete, such as analysis of body fluid, such as the use which filters a little liquid, for example, blood etc., sweat, and saliva, and filtration and analysis of a precious research sample or an expensive sample, for example, medicine manufacture industry, a medical institution, medical checkup industry, the chemical industry, and electronic industry. Moreover, it is used in its post and engine which carry out specially the field for which the so-called multiscreen plate with which much porosity objects were formed in one underframe is used, for example, the hemanalysis.

[0055] The sensor which what has the porosity object which has the sensor function obtained by the manufacture method of this invention, and a sensor function was infiltrated, and was obtained is used again as the existence of the specific matter and the detector of concentration, for example, a chemical sensor and a biosensor, a diagnostic drug, etc. As the measuring object, namely, for example, minerals (Na, K, P, Fe, Cl), Sugar, such as a glucose, a lipid (the total lipid, cholesterol, a neutral lipid, phospholipid, etc.), amino acid (a phenylalanine, leucine, etc.) and protein (the total protein --) Antibodies, such as hormone (an insulin, TSH, etc.), such as albumin, and an immunoglobulin, ****, false ****, a vitamin, the anti-sex matter, a medicine, the ketone body, a **** component, A urobilin object, the total nitrogen, a urea, a uric acid, ammonia, a creatinine, a creatine, Living thing related substances, such as which blood, urine, sweat, a component contained in saliva, a disease germ, a virus, and a cell membrane, BOD, inflammable gas (methane, LPG, etc.), a toxic material (it SOx(es) and NOx(es)) Chemicals, such as environmental related substances, such as humidity, such as a phenol, an underwater solution gas, and acids, the taste, the olfaction matter, etc. are mentioned. as a use purpose The analysis for a diagnosis and the analysis for medical treatment, for example, a pregnancy diagnosis, various infection diagnoses, a cancer diagnosis, The others which are an immune disorder disease, an autoimmune disease diagnosis, a hepatitis diagnosis, a liver, a kidney functional diagnosis, etc., Operation controls, such as a monitor of living body activity and an artificial organ, environmental measurement, environmental control, disaster prevention, operation of various processes, management, control, etc. are mentioned, and as an industrial field used For example, a medical institution, medical checkup industry, medicine manufacture industry, the chemical industry, a food stuff industry, the electrical and electric equipment and electronic industry, machine industry, engineering industry, defense / disaster prevention industry, etc. are mentioned. Also in the case of the use as a sensor, when an analyte is little, it sets, and it is especially used for it preferably. [as well as the case of the use as the above-mentioned filtration membrane]

[Translation done.]

* NOTICES *

EXAMPLE

[Example] Hereafter, although an example explains this invention still more concretely, thereby, the range of this invention is not limited. In addition, all the sections in an example are weight criteria.
[0057] The 0.5 sections, the isopropyl alcohol 120 section, and the water 50 section were mixed for the urethane acrylate oligomer 35 section which averages in 1 molecule with the [example 1] weight average molecular weight 2000, and has three acrylic machines, 1, the 6-hexanediol diacrylate 60 section, the acrylamide 5 section, and IRUGAKYUA 651 (the product made from Ciba-Geigy, ultraviolet-rays polymerization initiator), and the polymerization nature solution (1) was obtained.
[0058] By the film applicator, on the glass plate, the cast of the polymerization nature solution (1) was carried out so that thickness might change with 100 micrometers. It masks with the metal plate with a thickness of 0.08mm which the hole with a diameter of 5mm was moreover able to open at intervals of [10x10] 15mm, and, for wavelength, intensity is 2mW [100 //cm] at 360nm by the metal halide lamp. Ultraviolet rays were irradiated for 60 seconds. Before irradiation, it was observed in after transparent cast liquid's irradiating that only the irradiation section is changing to opalescence. Subsequently, after washing a glass plate by water and ethanol, it dried, the porosity object of opalescence was exfoliated from the glass plate, and the porosity object with a diameter [of 5mm] and a thickness of about 90 micrometers was acquired. According to the electron microscope, the polymer particle pasted up mutually and pore with a diameter of about 1 micrometer given as the gap were observed. Pore size and the pore configuration were almost the same in every position in the front face and film cross section of a porosity poly membrane.
[0059] It averages in 1 molecule with the [example 2] molecular weight 800. The 0.2 sections, the polyethylene-glycol (average molecular weight 400) 120 section, and the water 30 section were mixed for the urethane acrylate oligomer 25 section which has three acrylic machines, 1, the 6-hexanediol diacrylate 50 section, the n-butyl acrylate 20 section, the ARONIKUSU M-5400 [single organic-functions monomer which has product [made from Toagosei Chemistry], and carboxyl group] 5 section, and IRUGAKYUA 651, and the polymerization nature solution (2) was obtained.
[0060] A polymerization nature solution (2) is screen-stenciled in the configuration by which the round shape with a diameter of 5mm has been arranged at intervals of [10x10] 15mm on the base material of a polyethylene terephthalate (PET) sheet, and, for wavelength, intensity is 100 mW/cm2 at 360nm by the metal halide lamp. Ultraviolet rays were irradiated for 60 seconds. Before irradiation, after irradiation, the transparent paint film with a diameter of about 5mm changed to opalescence, and had hardened. Subsequently, after an acetone and water washed the hardened material the whole base material, it dried and the porosity object with a diameter [of 5mm] and a thickness of about 110 micrometers pasted up on the base material was acquired. According to the electron microscope, the polymer particle pasted up mutually and pore with a diameter of about 0.6 micrometers given as the gap were observed.
[0061] The urethane acrylate oligomer 60 section which averages in 1 molecule with the [example 3] molecular weight 800, and has three acrylic machines, 1, the 6-hexanediol diacrylate 40 section, the IRUGA cure-6510.3 section, the Tween 80 [product [made from Kanto Chemistry] and Nonion system

surfactant] 120 section, and the water 30 section were mixed, and the polymerization nature solution (3) with a viscosity [in 23 degrees C] of 400cps was obtained.
[0062] On a poly ethylene tetrafluoride (PTFE) film, the cylinder with the bore of 5mm, an outer diameter [of 6mm], and a length of 3mm made from polystyrene (PS) is placed perpendicularly, about 4mg polymerization nature solution 3 is poured in into it, and, for wavelength, intensity is 100 mW/cm2 at 360nm by the metal halide lamp. Ultraviolet rays were irradiated for 60 seconds. Before irradiation, in after the transparent polymerization nature solution's irradiating, it changed to opalescence and had hardened. Subsequently, after it removed the hardened material from on the PTFE film the whole cylinder made from PS and ethanol and water washed, it dried and the porosity object with a thickness of about 180 micrometers really fabricated by the base of the cylinder made from PS was acquired. The polymer particle which pasted up this porosity object of each other according to the electron microscope, and pore with a diameter of about 1 micrometer given as the gap were observed. Pore size and the pore configuration were almost the same in every position in the front face and film cross section of a porosity poly membrane.
[0063] It is ** masking vacuum deposition on the sheet made from [example 4] polyethylene terephthalate. one pair of carbon electrodes of 1mm of inter-electrode gaps -- 5x5 pieces -- forming -- ** -- on each, the polymerization nature solution (4) which added the glucose oxidase 0.1 section by screen-stencil in a polymerization nature solution (2), with a diameter of 6mm after allotting circularly Ultraviolet rays are irradiated. a polymerization nature solution (1) by screen-stencil on it [**], respectively With a diameter of 10mm after allotting circularly, ** It masked so that only the portion of the formed porosity object might irradiate, ultraviolet rays were irradiated, and after washing and drying in ** water and ethanol, 25 sensor intermediate fields were obtained by cutting ** base material.
[0064] 25 biosensors were formed by pasting up what ferry SHINAN-ized potassium solution was infiltrated into the porosity object with a thickness of about 180 micrometers really fabricated by the base of the cylinder made from PS which manufactured like the ** example 3 on the other hand 0.1% of the weight, and was dried on the sensor intermediate field obtained by ** in the epoxy resin only in the periphery section of ** porosity object. The thickness of the porous layer in which the thickness of the porous layer formed from the polymerization nature solution (4) of the obtained biosensor was formed from 55 micrometers and the polymerization nature solution (1) was 40 micrometers.
[0065] When the current measuring machine was connected to the carbon electrode of the sensor formed as mentioned above using the carbon paste and point arrival of the whole blood was carried out to the cylinder, the current according to the glucose concentration in blood was measured. When the same sample was measured by 20 sensors, coefficient of variation was as small as 4.7%.
[0066] the sheet top made from [example 5] polyethylene terephthalate -- ** masking vacuum deposition -- one pair of carbon electrodes of 1mm of inter-electrode gaps -- 5x5 pieces -- forming -- ** -- on each, a polymerization nature solution (2) is irradiated by screen-stencil, and ultraviolet rays are irradiated, with a diameter of 6mm after allotting circularly Then, after washing in water and ethanol, infiltrating the 0.01 % of the weight solution of ** glucose oxidases and incubating for 10 minutes at 40 degrees C, where a porosity object is infiltrated, ** water A polymerization nature solution (1) by screen-stencil on a porosity object, respectively With a diameter of 10mm after allotting circularly, ** After having masked so that only the portion of the formed porosity object might irradiate, irradiating ultraviolet rays and washing and drying in ** water and ethanol, ** base material was cut and 25 sensor intermediate fields were obtained.
[0067] 25 biosensors were formed by pasting up what ferry SHINAN-ized potassium solution was infiltrated into the porosity object with a thickness of about 180 micrometers really fabricated by the base of the cylinder made from PS which manufactured like the ** example 3 on the other hand 0.1% of the weight, and was dried on the sensor intermediate field obtained by ** in the epoxy resin only in the periphery section of ** porosity object. The thickness of the porous layer in which the thickness of the porous layer formed from the polymerization nature solution (2) of the obtained biosensor was formed from 55 micrometers and the polymerization nature solution (1) was 40 micrometers.

[0068] When the current measuring machine was connected to the carbon electrode of the sensor formed as mentioned above using the carbon paste and point arrival of the whole blood was carried out to the cylinder, the current according to the glucose concentration in blood was measured. When the same sample was measured by 20 sensors, coefficient of variation was as small as 5.4%.

[Translation done.]